Zuordnung dimensionelle Messgeräte zu Prüf- und Kalibriernormalen

This tabulated synopsis contains currently available artefacts which may be used as standards and which are suitable for the calibration of stylus or optical instruments and SPMs. Standards are listed in an arbitrary order within the sections without any ranking or preference. This list does not imply recommendation or endorsement by Physikalisch-Technische Bundesanstalt, nor does it imply that the listed standards are necessarily the best and/or only available for the purpose. No claim is put forward to the completeness and correctness of the list of manufacturers and products. If you know of further standards that might be included or if you have discovered outdated resp. incorrect data, PTB welcomes your feedback and appreciates any help to improve this list. This list may give a first overview, but it cannot replace consultation with the manufacturer resp. distributor. Please note that PTB itself does not sell standards and does neither benefit from the sale of standards nor from including them in this list. For certified calibration, please contact PTB or any other National Metrology Institute (NMI).

Last update: 2012-07-02

A) z - Axis: Single Step
B) z-Axis: Periodic Steps
C) z-Axis: Step Grating
D) x-, y-Axis: 1-Dimensional
E) x-, y-Axis: 2-Dimensional
F) 3D-Standards
G) Flatness
H) Thickness
I) Roughness
J) Critical Dimension
K) Tip Radius, Angle, Parallelity
L) Contour, Profile
M) Diameter, Roundness
N) Probing Force

Nr.	**Manufacturer** *Hersteller*	**Modell** *Model*	**Image**	**Measurement range** ***Messbereich***	**Lateral Measurement Range** ***lateraler Messbereich***	**Scanning Dimension** ***äußere Abmessungen (mm)***	**Scanning Force** ***Rasterkraft***	**Scanning electrone microscop** ***Rasterelektronen Mikroskop***	**Optical Microscop** ***Opt. Bild***	**Optical Profiler** ***Opt. Punkt***	**Taktil Punkt 3D**	**Taktil Scan 3D**
							SFM ***AFM***	**SEM** ***REM***	**Interference micr. Confocal whit light** ***Interferenz-mikr., Konfok., Weißli***	**Fokusssensor,** ***Chrom. Längs***	**Fibre sensor, µ- sensor** ***Faser-taster, Boss-Mikro-taster***	**Profilemeter** ***Profilometer***
					µm	mm						
	A) **z - Axis:** **Single Step**	***A)*** ***z - Achse:*** ***Einzelstufen***										
A01	SiMetricS	Depth Setting Standards VS	I	50 nm, ..., 1000 µm	50	50 x 50	x		x	x	x	x
A02	Pelco	AFM Gold Calibration Kit	I	5, 15, 30 nm		∅ 9,9	x					
A03	SLOAN/DEKTAK now Veeco		I	20, 50, 100, 200, 500, 1000, 5000, 10000		25 x 25 x 9	x					
A04	VLSI	SHS – 80, -180, -440, -880, -1800, -4500, -9400, - QC	I	8, 18, 44, 88, 180, 450, 940 nm		25 x 25 x 3	x	x				
A05	VLSI	SHS – 1.8, -8.0, -24.0, -50.0, - Q	I	1800, 8000, 24000, 50000 nm		25 x 25 x 3	x	x				
A06	Halle		I	200nm, ..., 9µm		40 x 20 x 10				x		x
A07	MTT		I	30, ..., 3000		∅ 37, 3 mm thick						

A08	PTB 5.1	Cu Depth Setting Standards	I	1, 5, 20, 50, 200, 450, 600, 900, 1000, 2000, 5000 µm	1, ..., 8 mm	45 x 23, thickness: 10/12				x	x	x

Home

	B) **z-Axis:** **Periodic Steps**	***B)*** ***z-Achse:*** ***periodische Stufen***										
B01	MikroMasch	TGZ, -01,-02,-03,-04, -11; TGF11	I	20nm, 100, 500, 1000, 1500nm	3mm x 3mm	5 x 5 x 0,45	x		x	x		
B02	MikroMasch	TGF11	I	1750nm	3mm x 3mm	5 x 5 x 0,45	x		x	x		
B03	NTT-AT	Si(111) Atomic Steps	I	0,13, 0,31 nm	6mm x 6mm	10 x 10	x		x	x		

Home

	C) **z-Axis:** **Step Grating**	***C)*** ***z-Achse:*** ***Stufen***										
C01	MikroMasch	UMG01, 02	I	20, 31 nm	400 x 400	5 x 5	x		x	x		
C02	VLSI	STS 2 –180P, -440P, -1000S, -1800S	I	18, 44, 100, 180 nm	270 x 270	12 x 8 x 0,675	x	x	x	x		
C03	VLSI	STS 3 –180, -440, -1000, -1800, P	I	18, 44, 100, 180 nm	270 x 270	12 x 8 x 0,5	x	x	x	x		
C04	VLSI	STR 3 –180, -440, -1000, -1800, -P	I	18, 44, 100, 180 nm	1 200 x 1 200	8 x 8	x	x	x	x		
C05	VLSI	STR 10 -180, -440, -1000, -1800	I	18, 44, 100, 180 nm	4 000 x 4 000	8 x 8	x	x	x	x		

C06	EU-Standard	partly available from Nanosensors	I	8, 24, 80, 240, 800, 2 400 nm	200 x 200 (1000 x 1000)	5 x 7	x	x	x	x		

Home

	D) **x-, y-Axis:** **1-Dimensional**	***D)*** ***x-, y-Achse:*** ***1-Dimensional***		Nominal pitch	Measur. Area							
D01	SiMetricS	Lateral Standard LS	I	10...2500 µm	250 ...62500	75 x 20		x		x	(x)	x
D02	ASM	750-HD	I	750 nm	0,3 mm dick	∅ 6,35	x	x	x			
D03	MikroMasch	TGG 01	I	3 000 nm	3 000 x 3 000	5 x 5 x 0,45	x	x	x			
D04	Moxtek	MXS – 301, -701,-CE	I	300, 700 nm		3 x 4 x0,5	x	x	x			

Home

	E) **x-, y-Axis:** **2-Dimensional**	***E)*** ***x-, y-Achse:*** ***2-Dimensional***										
E01	ML&C GmbH	Photomask	I	120 mm	120 mm x 120 mm	175 mm x 175 mm		x		x		x
E02	VLSI	STS 2 –180, -440, -1000, -1800	I	1 800 + 3 000 + 5 000 nm	270 x 270	12 x 8 x 0,675	x	x	x	x		
E03	VLSI	STR 3 –180, -440, -1000, -1800	I	3 000 nm	1 200 x 1 200	8 x 8	x	x	x	x		
E04	VLSI	STR 3 –180, -440, -1000, -1800	I	10 000 nm	4 000 x 4 000	8 x 8	x	x	x	x		

E05	EU-Standard	partly available from Nanosensors	I	100, 300 nm	200 x 200	5 x 7	x	x	x	x		
E06	EU-Standard	Partly available from Nanosensors / Ibsen	I	1 000, 3 000, 10 000 nm	2 000 x 2 000	5 x 7	x	x	x	x		
E07	Nanosearch Mem-brane	NanoCal	I	10 ... 15 nm			x	x				
E08	MikroMasch	TGX01	I	3 000 nm	2 000 x 2 000	5 x 5 x 0,45	x	x	x	x		
E09	Moxtek	MXS – 302 CE	I	300 nm		3 x 4 x 0,5	x	x	x	x		
E10	Moxtek	MXS – 702 CE	I	700 nm		3 x 4 x 0,5	x	x	x	x		
E11	NanoSensors		I	200 nm	500 x 500	7 x 7	x	x				
E12	Pelco	607 – AFM 607 – STM	I	463 nm (2160 lines/mm)			x	x				
E13	SIS		I	1 500 nm	100 x 100		x	x	x			
E14	Supracon	Nanoscale Linewidth/Pitch - Standard	I	Pitch: 160, 200, 230, 260, 300, 500, 700, 1000, 4000 nm CD: 80 nm to 2µm	10 x 10	8 x 8	x	x	x			

Home

	F) **3D-Standards**	***F)*** ***3D-Normal***										
F01	3D-Nano-Normal, BAM, Pyramide		I				x		x	x		

Home

	G) **Flatness**	***G)*** ***Ebenheit***										

G01	SiMetricS	Flatness Standard Type FtS	I	PV < 110/65 nm	10mm x 10mm/ 5mm x 5mm	15 x 15 x 6	x		x	x	x	x
G02	EU-Standard	partly available from Nanosensors	I	PV < 10 nm	250 x 250	5 x 7 x 2	x		x	x	x	x

Home

	H) Thickness	***H) Schichtdicke***										
H01	Inst. Mikro elektroden	SiO2 on Si	I	7, 20, 70, 300, 800	4000	5 x 7	x					

Home

	I) Roughness	***I) Rauheit***										
I01	VLSI	RAS-90, 220, 440, 900, 2250, 4700	I	9, 22, 44, 90, 225, 470	~5000 x 4500	25 x 25 x 6	x		x	x		x

Home

	J) Critical Dimension	***J) Kritische Dimension***										
J01	Pelco		I	1, 2, 5, 10µm	length 180 µm	4.8 x 4.5	x	x	x	x		
J02	Supracon	Nanoscale CD - Standard	I	CD: 50, 100, 150, 200, 300 und 800 nm	10 x 10	8 x 8	x	x	(x)			

Home

	K) **Tip Radius, Angle, Parallelity**	***K)*** ***Spitzenradius, Winkel, Parallelität***										
K01	SiMetricS	Type 1	I	4 gratings with the periods: 0.8; 1.0; 2.0; 2.5 µm ***Triangular profile:*** **GrT70** (angle 70.52°) ***Triangular profile:*** **GrT109** (angle 109.48°)		10 x 10	x		x	x		x
K02	SiMetricS	Type2	I	1 grating with the period: 8 ***or*** 25 µm ***Trapezoidal profile:*** **GrTz55** (Trapezoidal angle 54.74°) Depth: 3 µm for 8 µm period Depth: 11 µm for 25 µm period ***Triangular profile:*** **GrT70** (angle 70.52°) ***Triangular profile:*** **GrT109** (angle 109.48°) ***Arched profile:*** **GrA**		10 x 10	x		x	x		x
K03	SiMetricS	Type3	I	1 grating with the period: 8 ***or*** 25 µm ***Rectangular profile:*** **GrRw** Depth: 1 µm for 8 µm period Depth: 5 µm for 25 µm peri-od		10 x 10	x		x	x		x
K04	SiMetricS	Resolution standard Type 4 GrRd *Rectangular profile*	I	8 gratings with the periods: 4; 8; 20; 40; 80; 200; 400; 800 µm ***Rectangular profile:*** **GrRd** Depth: 90 nm or 3,4 µm			(x)		x	x	x	x

Home

	L) **Contour, Profile**	***L)*** ***Kontur, Profil***										
L01	PTB 5.3	Micro contour artefact	**I**	100 µm, 250 µm, 500 µm, 1000 µm, 2000 µm	0.5 x 0.5 to 18 x 3	50 x 3 x 15			x	x	x	x

Home

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	M) Diameter, Poundness	***M) Durchmesser, Zylindrizität***										
M01	PTB 5.3	Micro hole artefact	**I**	Ø 100 µm x 2.4 mm		10 x 10					x	

Home

	N) Probing Force	***N) Antastkraft***										
N01	SiMetricS	Probing force standard Type FC	**I**	0.005 – 1.0 mN/µm		15 x 15					x	x
N02	SiMetricS	Probing force standard Type FB	**I**	0.3 – 5.5 mN/µm		15 x 15					x	x

(x) – eingeschränkt

Manufacturer / Distributor and contact address

A01. SiMetricS GmbH, Siliziumkomponenten für die Messtechnik, Am Südhang 5, 09212 Limbach-Oberfrohna and J. Fruehauf, S. Kroenert, U. Brand, R. Krueger-Sehm: Attainable precision of silicon dimensional standards. Proc. Euspen Conf. (2004), joachim.fruehauf@e-technik.tu-chemnitz.de and < www.SiMetricS.de >

A02. PELCO INTERNATIONAL, P.O. Box 492477, Redding, CA 96049-2477, USA;< www.pelcoint.com/index >
A03. Veeco GmbH, D-85716 Unterschleißheim, Germany; < www.veeco-europe.com > or < www.veeco.com >
A04. VLSI Standards Inc.; 3087 North First Street; San Jose, CA 95134-2006, USA; < www.vlsistd.com >
A05. See A04.
A06. Halle Präzisions-Kalibriernormale GmbH, Im Bühfeld 12, D-31234 Edemissen, Germany; Fax: +49 5373 7669
A07. Meracia Technika- Technocentrum, P.O. Box 249, SK 84000 Bratislava, Slovakia; Fax: +42 17 6542 6143
A08. PTB Cu Depth Setting Standards, PTB, AG 5.11, Bundesallee 100, 38116 Braunschweig; < www.ptb.de/de/org/5/51/511/index.htm > and U. Brand, G. Hinzmann, H. Schnädelbach, C. Feist, P. Stuht, R. Krüger-Sehm, V. Jäger: Rückführbare Präzisions-Tiefen-Einstellnormale für Messbereiche von 1 µm bis 1 mm (Traceable precision depth setting standards for measurement ranges from 1 µm to 1 mm). Technisches Messen 66, 12 (1999), 496-503. uwe.brand@ptb.de

B01. MikroMasch, Narva mnt. 13, 10151 Tallina, Estonia; < www.mikromasch.com >
B02. See B01.
B03. NTT Advanced Techn. Corp., 3-1 Morinosato-Wakamiya, Atsugi, Kanagawa 243-0198, Japan; < www.keytech.ntt-at.co.jp >

C01. See B01.
C02. See A04.
C03. See A04.
C04. See A04.
C05. See A04.
C06. EU project "Transfer Standards for Calibration of SPMs" Information may be obtained from the coordinator Dr. Jørgen Garnæs, DFM, Lyngby, Denmark (JG@dfm.dk). NANOSENSORS, IMO-Building, Im Amtmann 6, D-35578 Wetzlar-Blankenfeld, Germany; <www.nanosensors.com >

D01. SiMetricS GmbH, Siliziumkomponenten für die Messtechnik, Am Südhang 5, 09212 Limbach-Oberfrohna

joachim.fruehauf@e-technik.tu-chemnitz.de and < www.SiMetricS.de >

D02. Advanced Surface Microscopy, Inc. 6009 Knyghton Rd; Indianapolis, IN 46220, USA; < www.asmicro.com >

D03. See B01.

D04. Moxtek Inc. Orem, UT 84057, USA; < www.moxtek.com >

E01. ML&C GmbH, Im Steinfeld 5, D-07751 Jena info@mlc-jena.de < www.mlc-jena.de >

E02. See A04.

E03. See A04.

E04. See A04.

E05. EU project "Transfer Standards for Calibration of SPMs” Information may be obtained from the coordinator Dr. Jørgen Garnæs, DFM, Lyngby, Denmark (JG@dfm.dk). NANOSENSORS, IMO-Building, Im Amtmann 6, D-35578 Wetzlar-Blankenfeld, Germany; <www.nanosensors.com > 7669 und Ibsen Photonics A/S, DK-3520 Farum, Denmark; < www.ibsenphotonics.com >

E06. EU project "Transfer Standards for Calibration of SPMs” Information may be obtained from the coordinator Dr. Jørgen Garnæs, DFM, Lyngby, Denmark (JG@dfm.dk). NANOSENSORS, IMO-Building, Im Amtmann 6, D-35578 Wetzlar-Blankenfeld, Germany; <www.nanosensors.com > und Ibsen Photonics A/S, DK-3520 Farum, Denmark; < www.ibsenphotonics.com >

E07. Nanosearch Membrane GmbH, TSP Nanoengineering, A-1160 Vienna, Austria; < www.nanosearch.at >

E08. See B01.

E09. See D04.

E10. See D04.

E11. NANOSENSORS, IMO-Building, Im Amtmann 6, D-35578 Wetzlar-Blankenfeld, Germany; <www.nanosensors.com >

E12. See A02.

E13. SIS Surface Imaging Systems GmbH; Kaiserstr. 100, D-52134 Herzogenrath, Germany; < www.sis-gmbh.com >

E14. Supracon AG, Wildenbruchstr. 15, 07745 Jena, Germany, Tel. +49 (3641) 67 53 80, Fax. +49 (3641) 67 53 87, info@supracon.com, < www.supracon.com >

F01. M. Ritter, Bundesanstalt für Materialforschung und-prüfung (BAM), Unter den Eichen 87, 12205 Berlin, info@bam.de < www.bam.de >

G01. See D01.
G02. EU project "Transfer Standards for Calibration of SPMs" Information may be obtained from the coordinator Dr. Jørgen Garnæs, DFM, Lyngby, Denmark (JG@dfm.dk). NANOSENSORS, IMO-Building, Im Amtmann 6, D-35578 Wetzlar-Blankenfeld, Germany; <www.nanosensors.com >

H01. Institute for Microelectronics Stuttgart, Allmandring 30 a, D-70569 Stuttgart, Germany;< www.ims-chips.de >

I01. See A04.

J01. See A02.
J02. See E14.

K01. See D01.
K02. See D01.
K03. See D01.
K04. See D01.

L01. Neugebauer M, Jusko O, Neuschaefer-Rube U, Wäldele F: Darf´s etwas kleiner sein? Quality Engineering, 9 (2004), 32. And: Neugebauer M, Neuschaefer-Rube U: A new micro artefact for testing of optical and tactile sensors. Proceedings of Euspen conference 2005. michael.neugebauer@ptb.de

M01. Brand, U; Neugebauer, M; Neuschaefer-Rube, U; Wilkening, G: Micro-Standards – State of the Art, Prospects and Limits. Proc. Sensor Conf., Vol. 2 (2005), 169-174. ulrich.neuschaefer-rube@ptb.de

N01. See D01.
N02. See D01.

Home